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| 10/711,108      | 08/24/2004  | Charles Steven Korman | 147903-1            | 5107             |

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GENERAL ELECTRIC COMPANY  
GLOBAL RESEARCH  
PATENT DOCKET RM. BLDG. K1-4A59  
NISKAYUNA, NY 12309

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| EXAMINER |
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TRINH, THANH TRUC

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| ART UNIT | PAPER NUMBER |
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1795

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07/23/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ldocket@crd.ge.com  
rosssr@crd.ge.com  
parkskl@crd.ge.com

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|------------------------------|--------------------------------------|---|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/711,108 | <b>Applicant(s)</b><br>KORMAN, CHARLES STEVEN |  |
|                              | <b>Examiner</b><br>THANH-TRUC TRINH  | <b>Art Unit</b><br>1795                       |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 April 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Remarks*

1. Claims 1-28 are pending in the application.
2. Rejections under 35 U.S.C 112, first and second paragraphs are withdrawn due to Applicant's amendments.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
- 
3. Claims 1-3, 7-12, 15-17 and 21-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole (US Patent 6008449) in view of either Stein et al. (US Patent 5071491) or Hollaus et al. (US Patent 4567316)

Regarding claims 1 and 15, as seen in Figure 5, Cole discloses a solar cell assembly comprising a plurality of solar cells (18, 20, 22, 24, etc...) each having a first side and a second side, and each of the plurality of solar cells configured to produce an electrical current when receiving photons on at least the first side; an encapsulant (cover plate 16) operably coupled to the first side of each of the plurality of solar cells; an insulative substrate (26) operably coupled to the second side of the solar cells; a metal foil (or reflective layer 48) having a first surface bonded to the insulative substrate and a second surface including an interconnect pattern in electrical contact with pads (e.g. 68) located on a same side of each solar cell for electrically interconnecting a plurality of solar cells in a series string. The second surface of the metal foil includes a light reflector (e.g. v-shaped patterns) disposed at exposed regions on the second surface, wherein the light reflector is configured to reflect light incident thereon to increase a concentration of light on the solar cell. (See Figures 1, 3-5, and 7)

Cole does not specifically teach including an edge connector and a bypass diode so that the electrical current from each solar cell in the series string is transported from the pads and combined at an edge connector, and series string is bypassed in case of failure of the series string.

Stein et al. teaches connecting a plurality of solar cells (e.g. 1 as seen in Figure 1) to form a series string, wherein the electrical current from each solar cell in the series string is transported to the conductive frame parts 2 and 3 which act as positive and negative electrical terminals (See Figure 1). It is the Examiner's position that the conductive frame parts 2 and 3 are the edge connector. Stein et al. also teaches

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integrating a bypass diode into the solar cell equipment or into the frame (See col. 3 line 67 through col. 4 line 4).

Hollaus et al. teaches connecting a plurality of solar cells to form a series string (see Figures 1-2 and 3a-b), wherein the electrical current from each solar cell in the series is transported to the edge connector such as conductor 7 (see Figures 1-2) or conductor ribbon 20 at the edge of the solar module 5 (see Figures 3a-b). Hollaus et al. also teaches including bypass diode (e.g. 4 in Figures 1-2; 41-45 in Figures 3a-b) to prevent voltage reversal (See col. 2 lines 10-20).

It would have been obvious to one skilled in the art at the time the invention was made to modify the solar cells assembly of Cole by including edge connectors and bypass diode as taught by either Stein et al. or Hollaus et al., because both Stein et al. and Hollaus et al. teach the edge connector is used to connect a plurality of rows of solar cells into a string within a limited space (See Figure 1 of Stein et al., Figures 1-2 and 3a-b of Hollaus et al.) and the bypass diode is required to prevent failure of the series string (e.g. heating, voltage reversal, see col. 1 lines 63-65 of Stein et al., col. 1 lines 10-20 of Hollaus et al.)

Regarding claims 2-3 and 16-17, Cole teaches the substrate (26) is made of acrylic decal (see col. 5 lines 23-26). Therefore it is the Examiner's position that the substrate comprises a flexible polymeric substrate.

Regarding claims 7 and 21, Cole teaches the metal foil (or metallic reflective layer 48) is made of electrically conductive metal (see col. 5 lines 54-56 and col. 9 lines 22-67). Coles also teaches the material used is low cost (See col. 3 line 54 through col.

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4 line 44). Therefore it is the Examiner's position that the metal foil is a conductive metal foil selected on a basis of cost, electrical and thermal performance.

Regarding claims 8 and 22, Cole teaches the metal foil (or metallic reflective layer 48) is electrically conductive and bonded directly to the substrate of the solar cells at a bond site 72b. (See Figure 5 and col. 9 lines 22-46). Therefore it is the Examiner's position that the metal foil (or metallic reflective layer 48) is patterned to match at least an interconnection configuration of the solar cell and a PV laminate module.

Regarding claims 9-12 and 23-26, Cole teaches the metal foil (or metallic reflective layer 48) is made of metal and electrically conductive (see col. 5 lines 54-56 and col. 9 lines 22-67). Therefore it is the Examiner's position that the metal foil (or metallic reflective layer 48) is configured to provide a low resistance interconnection of a plurality of solar cells while providing a thermal sink for heat generated by each cell, the heat generated by at least one of the solar cells and absorbed solar radiation internal to the module is channeled to an edge defining module via the metal foil, and the edge defining module is configured to dissipate the generated heat by one of radiation and convection. It is also the Examiner's position that the metal foil (or metallic reflective layer 48) functions as an electrical conductor, thermal conductor, and an optical reflector.

4. Claims 4-6, 13, 18-20 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole in view of either Stein et al. or Hollaus et al., and further in view of Epstein (US Patent Application Publication 20030058553).

Cole in view of Stein et al. teaches a photovoltaic assembly as applied to claims 1-3, 7-12, 15-17 and 21-26 above.

Cole in view of Stein et al. does not teach coating the metal foil (24) with a reflective coating such as reflective ink of colloidal of glass spheres in an optical transparent binder.

Epstein teaches a light directing film (or for reflecting light) having metal coating film (130 in Figure 3, 230 in Figure 5) on a patterned surface (114 in Figure 3, 214 in Figure 5), wherein the metal coating film is overlain by a layer (135 in Figure 3 and 235 in Figure 5) of glass beads in polymethyl-methacrylate (136 in Figure 3 and 236 in Figure 5). (See paragraphs 0101-0107 and 0112-0118). It is the Examiner's position that polymethyl-methacrylate is an optical transparent binder.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the assembly of Cole by coating the metal layer (or metal foil 24) with a reflective ink of glass beads (or colloidal suspension of glass spheres) in polymethyl-methacrylate (or optically transparent binder) as taught by Epstein, because Epstein teaches that the glass beads in polymethyl-methacrylate layer would improve the performance and durability of the reflective metal coating (see paragraphs 0083-0088). In addition, because both Cole and Epstein are concerning with reflecting light, one would have reasonable expectation of success from the combination.

5. Claims 14 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole in view of either Stein et al. or Hollaus et al., and further in view of Glenn (US Patent 6313396)

Cole in view of Stein et al. teaches a photovoltaic assembly as applied to claims 1-3, 7-12, 15-17 and 21-26 above.

Cole in view of Stein et al. does not teach the substrate includes a plurality of metallized vias to allow dissipation of heat therethrough.

Glenn teaches a photovoltaic assembly having a substrate (18, Figures 1, 3A-B, 4-5) with vias (or openings 22 as seen in Figure 22) filled with metal (conducting element 17 – See Figures 1, 3A-B, 4-5; col. 4 line 10 through col. 6 line 44). Therefore it is the position of the Examiner that Glenn teaches a substrate includes a plurality of metallized vias to allow dissipation of heat therethrough.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the assembly of Cole in view of Stein et al. to include a plurality of metallized vias to allow dissipation of heat therethrough as taught by Glenn, because Glenn teaches the photovoltaic assembly with such substrate is lightweight and inexpensive to manufacture. (See col. 8 lines 63-67 of Glenn).

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-28 have been considered but are moot in view of the new ground(s) of rejection.



Applicant argues that Cole does not teach an interconnect pattern in electrical contact with pads located on a same side of each solar cell and the series string including a bypass diode for allowing the series string to be bypassed in case of failure of the series string. However, Applicant's argument is not deemed to be persuasive. Cole does teach the interconnect pattern in electrical contact with pads (e.g. or connecting sites) located on the same side of each solar cell (e.g. on the side of substrate 68) as seen in Figure 5. Both Stein et al. and Hollaus et al. teach edge connector and bypass diode integrated into the string to prevent failure of the series string. (See the rejection above).

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to THANH-TRUC TRINH whose telephone number is (571)272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/  
Supervisory Patent Examiner, Art Unit 1753

TT  
7/17/2009